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CLAIMS:

What is claimed is:

- 1. A method for performing OTDM, said method comprising the following steps:
- a) generating n bit streams of approximately B Gb/s from respectively n tunable laser beams having respectively wavelengths of $\lambda 1$, $\lambda 2$, ... and λn ;
- b) generating from said n bit streams n group velocity dispersed bit streams by introducing group velocity dispersion into said n bit streams;
- c) combining said n group velocity dispersed bit streams into a composite bit stream of approximately nB Gb/s; and
- d) in response to misalignment of bits within said composite bit stream, tuning said $\lambda 1$, $\lambda 2$, ... and λn to create the proper OTDM time differential between consecutive bits within said composite bit stream.
 - 2. The method of Claim 1, further comprising the following steps:
- e) generating a single-wavelength composite bit stream of approximately wavelength λv and nB Gb/s by operating on said composite bit stream with a wavelength converter; and
- f) in response to misalignment of bits within said single-wavelength composite bit stream, tuning said $\lambda 1$, $\lambda 2$, ... and λn to create the proper OTDM time differential between consecutive bits within said single-wavelength composite bit stream.
 - 3. An OTDM transmitter, comprising:

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- a) n channels of bit streams D1, D2, ... and Dn having respectively wavelengths of $\lambda 1$, $\lambda 2$, ... and λn , wherein for j = 1 to n, the j-th channel comprises:
 - j1) a tunable laser source Sj providing a bit stream Bj of approximately B Gb/s; and
 - j2) a group velocity dispersive element Ej coupled to said Sj, introducing group velocity dispersion into said Bj to generate said Dj;
- b) a combiner coupled to said n channels and adapted to optically combine said D1, D2, and Dn into a composite bit stream of approximately nB Gb/s; and
- c) a wavelength converter coupled to said combiner and adapted to convert said composite bit stream into a single-wavelength composite bit stream of approximately nB Gb/s to be transmitted through an optical link, wherein OTDM time differential can be created between consecutive bits of said single-wavelength composite bit stream by tuning $\lambda 1, \lambda 2, ...$ and λn .
- 4. A method for performing OTDM transmission, said method comprising the steps of:
- a) generating n bit streams of approximately B Gb/s from respectively n tunable laser beams having respectively initial wavelengths of $\lambda 1$, $\lambda 2$, ... and λn ;
- b) generating n group velocity dispersed bit streams by introducing group velocity dispersion into said n bit streams;
 - c) combining said n group velocity dispersed bit streams into a composite bit stream of approximately nB Gb/s;

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- d) generating a single-wavelength composite bit stream of wavelength λv by wavelength converting said composite bit stream with a wavelength converter;
- e) in response to misalignment of bits within said single-wavelength composite bit stream, tuning said $\lambda 1$, $\lambda 2$, ... and λn to create the proper OTDM time differential between consecutive bits within said single-wavelength composite bit stream; and
- f) transmitting said single-wavelength composite bit stream by launching said single-wavelength composite bit stream into an optical transmission link.

5. A WDM system, comprising:

a) m OTDM channels, wherein for k = 1 to m, the k-th OTDM channel comprises:

k1) n channels Vk1, Vk2, ... and Vkn providing respectively bit streams Dk1, Dk2, ... and Dkn having respectively wavelengths of λ k1, λ k2, ... and λ kn, wherein for j = 1 to n, the j-th channel Vkj comprises:

- kj1) a tunable laser source Skj providing a bit stream Bkj of approximately B Gb/s; and
- kj2) a group velocity dispersive element Ekj coupled to said Skj, introducing group velocity dispersion into said Bkj to generate said Dkj;
- k2) a combiner coupled to said n channels and adapted to optically combine said n bit streams into a composite bit stream Uk;
- k3) a wavelength converter coupled to said combiner and adapted to convert said composite bit stream into a single-wavelength composite bit stream Ak of

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wavelength λvk , wherein the proper OTDM time differential can be created between consecutive bits of said Ak by tuning $\lambda k1$, $\lambda k2$, ... and λkn ; and

- b) a WDM multiplexer coupled to said m OTDM channels, with said WDM multiplexer adapted to generate a composite optical signal with a data rate of approximately mnB Gb/s.
- 6. An OTDM subsystem for performing optical time-division-multiplexing, said OTDM subsystem comprising:
- a) n channels of bit streams D1, D2, ... and Dn having respectively wavelengths of $\lambda 1, \lambda 2, ...$ and λn , wherein for j = 1 to n, the j-th channel comprises:
 - j1) a tunable laser source Sj providing a bit stream Bj of approximately B Gb/s; and
 - j2) a group velocity dispersive element Ej coupled to said Sj, introducing group velocity dispersion into said Bj to generate said Dj;
- b) a combiner coupled to said N channels and adapted to optically combine said said D1, D2, and Dn into a composite bit stream of approximately nB Gb/s, wherein OTDM time differential can be created between consecutive bits of said composite bit stream by tuning $\lambda 1, \lambda 2, ...$ and λn .
- 7. The Claims of 2-6, wherein return-to-zero (RZ) format is used in generating bit streams.
 - 8. The Claims of 2-6, wherein said B Gb/s is 10 Gb/s, and wherein said n is 4.

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- 9. The Claims of 2-6, wherein said B Gb/s is 40 Gb/s, and wherein said n is 4.
- 10. The Claims of 2-5, wherein said wavelength converter is a vertical lasing semiconductor optical amplifier (VLSOA), and wherein said single wavelength is generated from the vertical lasing of said VLSOA.
 - 11. The Claims of 2-5, wherein said wavelength converter uses four-wave mixing.
 - 12. The Claims of 2-5, wherein said wavelength converter is a MZ-SOA.
 - 13. The Claims of 2-5, wherein said wavelength converter is a SOA.
- 14. The method of Claim 1, wherein said n bit streams are generated by modulating respectively n CW tunable laser sources.
- 15. The method of Claim 1, wherein said n bit streams are generated respectively by n directly modulated tunable laser sources.
- 16. The OTDM transmitter of Claim 3, wherein for said j=1 to n, said Sj in said j20 th channel is a CW tunable laser that is coupled to a modulator Mj, said Mj modulating a
 laser beam Lj generated by said Sj into said Bj.

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- 17. The OTDM transmitter of Claim 3, wherein for said j=1 to n, said Sj in said j-th channel is a tunable laser that is directly modulated.
- 18. The method of Claim 4, wherein said n bit streams are generated by modulating respectively n CW tunable laser sources.
 - 19. The method of Claim 4, wherein said n bit streams are generated respectively by n directly modulated tunable laser sources.
 - 20. The WDM system of Claim 5, wherein for k=1 to m and j = 1 to n, said tunable laser source Skj in said j-th channel Vkj is a tunable CW laser source that is coupled to a modulator Mkj, said Mkj modulating a laser beam Lkj produced from said Skj into said stream Bkj.
 - 21. The WDM system of Claim 5, wherein for k=1 to m and j=1 to n, said tunable laser source Skj in said j-th channel Vkj is a tunable laser that is directly modulated.
 - 22. The OTDM subsystem of Claim 6, wherein for said j=1 to n, said Sj in said j-th channel is a CW tunable laser that is coupled to a modulator Mj, said Mj modulating a laser beam Lj generated by said Sj into said Bj.

23. The OTDM subsystem of Claim 6, wherein for said j=1 to n, said Sj in said j-th channel is a tunable laser that is directly modulated.